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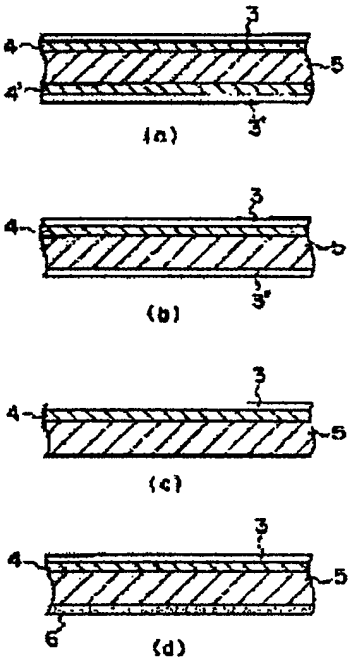
(54) BRAZING SHEET MADE OF ALUMINUM ALLOY

(57)Abstract:
PROBLEM TO BE SOLVED: To prepare a brazing sheet made of Al alloy, excellent in corrosion resistance and suitable for a heat exchanger to be joined and assembled by means of brazing, particularly noncorrosive flux brazing.
SOLUTION: A core material 5, composed of an Al alloy having a composition consisting of, by mass, 0.5-2.0% Mn, 0.1-1.0% Cu, 0-1.0% Mg, 0-0.3% Ti, and the balance Al with inevitable impurities, is used. One side or both sides of this core material 5 are provided with intermediate layers 4, 4' each having 30-150μm thickness and composed of an Al alloy consisting of 0.01-2.0% Mn, 0.05-5.0% Zn, 0-0.3% Ti, ≤ 0.05% Mg, ≤0.05% Cu, and the balance Al with inevitable impurities. Further, the intermediate layers are clad with Al-Si alloy brazing filler metals 3, 3' to 30-150μm cladding thickness, respectively.



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CLAIMS

[Claim(s)]
[Claim 1] Mn: 0.5 - 2.0mass% (it is only described as % below), Cu:0.1-1.0%, To one side or both sides of aluminum alloy core material to which Mg:0-1.0% and Ti:0-0.3% are contained, and the remainder consists of aluminum and an unescapable impurity Mn:0.01-2.0%, Zn:0.05-5.0%, and Ti:0-0.3% are contained. Furthermore, it is aluminum alloy with which it regulates less than [Mg:0.05%] and less than [Cu:0.05%], and the remainder consists of aluminum and an unescapable impurity. The brazing sheet made from aluminum alloy which carries out the description of having prepared the interlayer whose thickness is 30-150 micrometers, and having doubled aluminum-Si system alloy wax material by 30-150-micrometer clad thickness on said interlayer.
[Claim 2] The brazing sheet made from aluminum alloy according to claim 1 characterized by making said aluminum-Si system alloy wax material contain Sn:0.05-0.5% further.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates an automobile, the heat exchanger made from aluminum alloy of various industrial use, etc. to the corrosion resistance suitable outstanding brazing sheet made from aluminum alloy for this, when soldering and carrying out junction assembly especially by noncorrosive flux, soldering (blazing) and. In addition, in this specification, although all presentations of aluminum alloy are mass%, they are omitted and % only describes them.
[0002]
[Description of the Prior Art] When manufacturing the complicated structures, such as a heat exchanger made from aluminum alloy, the soldering method is an effective junction means. This soldering method makes aluminum or aluminum alloy a core material, and it is fabricated in various configurations using the brazing sheet which carried out the clad to those one side or both sides, using aluminum alloy wax material as hide material. These members, predetermined structure, for example, heat exchanger, in assembly and noncorrosive flux (fluoro potassium aluminate complex salt) soldering KAlF4, K2 AlF5, and K3 AlF6 etc. -- after applying mixed flux, it is the approach of soldering by heating this in nitrogen reducing atmosphere.
[0003] Various kinds of aluminum alloys for core materials and aluminum alloy wax material for hide material are developed by the brazing sheet, and it is standardized by JIS-Z -3263 and JIS-H -4000 about these ingredients in current. As a brazing sheet for soldering used for a heat exchanger, JIS3003 (example aluminumof representation-0.15%Cu-1.1%Mn alloy) and JIS6951 (example aluminum-of representation0.4%Si-0.3%Cu-0.6%Mg alloy) are used as a core material, and, usually JIS4045 (example aluminumof representation-10%Si alloy) and JIS4343 (example aluminumof representation-7.5%Si alloy) wax material are used as hide material. Moreover, board thickness of a brazing sheet is about 0.3-1.5mm, to total board thickness, the rate of a clad of wax material is 5 - 15% per one side, and the clad is carried out to one side or both sides.
[0004] As a heat exchanger made from aluminum alloy which has the hollow structure using such a brazing sheet, the DORON cup type evaporator, the oil cooler, the radiator, etc. are manufactured. As shown in drawing 4 , for example, the DORON cup type evaporator 10 The brazing sheet which carried out the clad of the aforementioned aluminum alloy wax material is used for both sides of the aforementioned aluminum alloy core material. The refrigerant path shaping member 1 as shown in drawing 2 and drawing 3 is manufactured by press forming. It is what arranged the corrugated fin 2 between the members 1 which carried out the laminating and carried out the laminating of this member 1 as shown in drawing 4 , arranged and carried out assembly of side plates 7 and 7, the refrigerant inlet pipe 8, and the refrigerant outlet pipe 9 further, and soldered this. Soldering is performed by heating to about 873 K in nitrogen-gas-atmosphere mind.
[0005]
[Problem(s) to be Solved by the Invention] The thinning of ingredient board thickness is being required of the heat exchanger for automobiles with lightweight-izing of an automobile. On the other hand, since

the operating environment of an automobile is various, the ingredient which can bear all service conditions is needed. Especially in the heat exchanger, it is anxious for the development of a brazing sheet whose corrosion resistance is the demand characteristics most important for an ingredient, and corrosion resistance has it, and various examination is performed.

[0006] Although the corrosion resistance of a brazing sheet is related to the element part blanket-like voice of the direction of board thickness of an ingredient, when the element contributed to the corrosion resistance of ingredients, such as Cu and Zn, performs soldering heating, it will be in the distribution condition of the front flesh-side symmetry centering on a board thickness core. Therefore, when pitting occurs on a brazing sheet front face, the pitting advance after the ingredient with the pitting advance slower than a board thickness core by the side of a front face passes a board thickness core becomes quick. That is, although the part which contributes to corrosion-resistant improvement is the one half of board thickness, there is a limitation in an improvement of the penetration life by the element addition to a core material instead of an overstatement.

[0007] Moreover, addition of Cu is added by the core material of a brazing sheet in order to make potential of aluminum **, and to raise corrosion resistance. However, Cu added in the core material is diffused in the wax material fused at the time of soldering heating, and in case wax material solidifies after soldering heating, the eutectic section discharges and condenses. Therefore, the corrosion of the layer to which wax material re-solidified the brazing sheet with much Cu to the core material advances quickly. Therefore, there is a limitation in the addition of elements, such as Cu for corrosion-resistant improvement, to the core material of a brazing sheet.

[0008] Moreover, in noncorrosive flux soldering, since the fluoride which the aforementioned flux and Mg in an ingredient react, will shine, and checks a sex is generated, Mg cannot be added into an ingredient. Therefore, the diffusion to the wax material of Mg in a core material is prevented, and preparing the interlayer who consists of a 1XXX system alloy ingredient of JIS 1050 and 1070 and 1100 grades between a core material and wax material for the purpose of improvement in soldering nature is proposed, and carrying out the purpose of the corrosion resistance improvement in a core material, and preparing the interlayer who added Zn etc. further to said interlayer material is also proposed (for example, JP,2-30394,A). However, it was not able to be said that this brazing sheet was still more enough in respect of corrosion resistance and the reinforcement of an ingredient. The technical problem of this invention is solving the aforementioned problem, is specifically the point of corrosion resistance and the reinforcement of an ingredient, and is finding out the further excellent brazing sheet made from aluminum alloy.

[0009]

[Means for Solving the Problem] In order to solve the aforementioned problem and for this invention persons to raise the corrosion resistance of a brazing sheet member wholeheartedly as a result of examination In order to prevent the diffusion to the wax material of elements, such as Cu in the diffusion and the core material to the core material of wax material, during soldering heating The middle class is prepared between wax material and a core material, this middle class's alloy presentation and knowledge that clad thickness is greatly related to the corrosion resistance of a brazing sheet and material strength are acquired further, and this invention is completed.

[0010] Namely, invention of claim 1 for solving the aforementioned technical problem Mn: 0.5-2.0%, Cu:0.1-1.0%, Mg:0-1.0%, To one side or both sides of aluminum alloy core material to which Ti:0-0.3% is contained and the remainder consists of aluminum and an unescapable impurity Mn:0.01-2.0%, Zn:0.05-5.0%, and Ti:0-0.3% are contained. Furthermore, it is aluminum alloy with which it regulates less than [Mg:0.05%] and less than [Cu:0.05%], and the remainder consists of aluminum and an unescapable impurity. Thickness is the brazing sheet made from aluminum alloy which carries out the description of having prepared the interlayer who is 30-150 micrometers, and having doubled aluminum-Si system alloy wax material by 30-150-micrometer clad thickness on said interlayer, and it is [0011]. Invention of claim 2 is a brazing sheet made from aluminum alloy according to claim 1 characterized by making said aluminum-Si system alloy wax material contain Sn:0.05-0.5% further.

[0012]

[Embodiment of the Invention] Hereafter, this invention is further explained to a detail. Invention of claim 1 Mn:0.5-2.0%, Cu:0.1-1.0%, To one side or both sides of aluminum alloy core material to which Mg:0-1.0% and Ti:0-0.3% are contained, and the remainder consists of aluminum and an unescapable impurity Mn:0.01-2.0%, Zn:0.05-5.0%, and Ti:0-0.3% are contained. Furthermore, it is aluminum alloy with which it regulates less than [Mg:0.05%] and less than [Cu:0.05%], and the remainder remainder consists of aluminum and an unescapable impurity. Thickness prepares the interlayer who is 30-150 micrometers, and considers as the summary of invention of the brazing sheet made from aluminum alloy which doubled aluminum-Si system alloy wax material by 30-150-micrometer clad thickness on said interlayer. That is, it is the brazing sheet which prepared the interlayer with a thickness of 30-150 micrometers in one side or both sides of an aluminum-Mn-Cu-(Mg)-(Ti) alloy core material with the aluminum-Mn-Zn-(Ti) alloy, and carried out the thickness 30-150-micrometer clad of the aluminum-Si system alloy wax material further on this interlayer.

[0013] When the configuration of the cross section of this brazing sheet is explained by a diagram, as shown in drawing 1 (a), (b), (c), and (d), there are four modes according to the purpose of use. (a) of drawing 1 is interlayers 4 and 4 to both sides of a core material 5, It prepares and is the wax material 3 and 3 on both this interlayer, It is what was prepared and they are an oil cooler in the case of thinking the corrosion resistance of an inside-and-outside side as important, for example, the tube (those with an inner fin) of a car heater, etc. as an actual application. although (b) forms an interlayer 4 in one side of a core material 5 and forms the wax material 3 on this interlayer -- the relation of an application to the core material 5 -- on the other hand -- being also alike -- wax material 3, It is what was prepared and is a DORON cup type evaporator as [as an actual application, shown in drawing 4 by the case where outside corrosion resistance is thought as important, for example] etc. (an inside is not so important for corrosion resistance in this case because of chlorofluocarbon).

[0014] although (c) forms an interlayer 4 in one side of a core material 5 and forms the wax material 3 on this interlayer -- the relation of an application to the core material 5 -- on the other hand -- being alike -- wax material 3, There is nothing and it continues being nakedness. As an actual application, it is the tube (welded tube tube) of a parallel flow type capacitor etc. in the case where outside corrosion resistance is thought as important, for example (an inside is not so important for corrosion resistance in this case because of chlorofluocarbon). (d) -- one side of a core material 5 -- an interlayer 4 -- preparing -- this interlayer top -- the wax material 3 -- preparing -- a core material 5 -- on the other hand -- being alike -- sacrifice material 6 like 7072 (aluminum-Zn alloy) is formed. As an actual application, it is the tube (welded tube tube) of a radiator etc., for example (in this case, an inside is water and external surface is the open air).

[0015] Although the concrete configuration of the brazing sheet concerning this invention is as above next, it explains aluminum alloy used for the core material of the sheet of this invention. The semantics of the alloying element of a core material alloy and the reason for limitation of the addition range are as follows. Although it adds 0.1 to 1.0% in order that Cu may raise corrosion resistance, under by the lower limit, it becomes that the effectiveness is weak and it is easy to generate the grain community corrosion exceeding a upper limit, and since the diffusing capacity to the core material of wax material also increases, corrosion resistance is reduced. Therefore, although the range is made into 0.1 - 1.0%, considering as 0.15 - 0.5% is more desirable.

[0016] Although it adds 0.5 to 2.0% for the improvement in on the strength, under by the lower limit, Mn has little effectiveness of the improvement in on the strength, and its diffusing capacity of the wax material to a core material increases during heating by exceeding a upper limit, and it reduces soldering nature and corrosion resistance. Therefore, although the range is made into 0.5 - 2.0%, considering as 0.8 - 1.5% is more desirable.

[0017] Mg is added 0 to 1.0% for the improvement in on the strength. 0% (less than 0.01%), 0 - 1.0% of semantics is the case where it does not add at all, and when adding, it is made into 0.01 - 1.0%. If an addition exceeds 1.0%, during soldering heating, the diffusing capacity of the wax material to a core material will increase, and soldering nature and corrosion resistance will be reduced. Therefore, the range is made into 0 - 1.0%. Specifically, it is desirable to add as follows by the aforementioned purpose

of use. That is, when it is the four-layer material (b of drawing 1) from which an interlayer is prepared only for one of the two between wax material and a core material, and other sides serve as wax material, Mg is not added to a core material or 0.05% or less of addition is desirable in respect of the soldering nature (cursing a side the wax material 3 of b of drawing 1 , and sex) by noncorrosive flux. moreover, although an interlayer is prepared only for one of the two between wax material and a core material, when it is the three-layer material and four-layer material (c of drawing 1 , d) which are alike on the other hand and do not have wax material in the case of the five-layer material (a of drawing 1) which prepares an interlayer in both between wax material and a core material, addition of Mg to a core material is 0.1 - 0.6% preferably 0.05 to 1.0%.

[0018] Ti is added 0 to 0.3%, in order to raise corrosion resistance. 0% (less than 0.01%), 0 - 0.3% of semantics is the case where it does not add at all, and when adding, it is made into 0.01 - 0.3%. If an addition exceeds 0.3%, the crystallization object of big and rough Ti will be produced, and corrosion resistance will be injured conversely. Therefore, although the range of Ti is made into 0 - 0.3%, whether it adds or it does not carry out choose suitably by the application of a product, and it is determined. In addition, when adding, it is more desirable to consider as about 0.05 - 0.2%.

[0019] Although there are Si, Fe, Cr, Zn, etc. as an unescapable impurity by elements other than the above in a core material, Fe is especially satisfactory 0.7% or less 0.6% or less, if 0.20% or less and Zn of Cr are 0.40% or less, the range, i.e., Si, generally permitted. However, about Si and Fe, it is more desirable to consider as less than [Si0.20%] and less than [Fe0.20%].

[0020] Next, the aluminum-Mn-Zn-(Ti) alloy used for the interlayer material of the brazing sheet made from aluminum alloy by this invention is explained. Although Mn of an alloying element contributes to improvement in the reinforcement of an ingredient and Zn and Ti contribute to the corrosion resistance improvement in an ingredient, it is as follows for details. Although it adds 0.01 to 2.0% for the improvement in on the strength, at less than 0.01%, Mn has little effectiveness of the improvement in on the strength, and its diffusing capacity of the wax material to interlayer material increases during heating by exceeding 2.0%, and it reduces corrosion resistance. Therefore, although the range is made into 0.01 - 2.0%, considering as 0.3 - 1.3% is more desirable.

[0021] In order to raise corrosion resistance, it adds 0.05 to 5.0%, but under by the lower limit, the middle class's self-corrosion resistance will fall and Zn will check the corrosion resistance as a brazing sheet, if there is little effectiveness of corrosion-resistant improvement and it exceeds a upper limit. Therefore, although the range is made into 0.05 - 5.0%, considering as 0.5 - 3.0% is more desirable.

[0022] Ti is added 0 to 0.3%, in order to raise corrosion resistance. 0% (less than 0.01%), 0 - 0.3% of semantics is the case where it does not add at all, and when adding, it is made into 0.01 - 0.3%. If an addition exceeds 0.3%, the crystallization object of big and rough Ti will be produced, and corrosion resistance will be injured conversely. Therefore, although the range of Ti is made into 0 - 0.3%, whether it adds or it does not carry out choose suitably by the application of a product, and it is determined. In addition, when adding, it is more desirable to consider as about 0.05 - 0.2%.

[0023] In order that Mg may form flux and a fluoride, may shine in the case of noncorrosive flux soldering and may check a sex, it is regulated to 0.05% or less. In order that Cu may be diffused in wax material and may check corrosion resistance in the case of soldering, it is regulated to 0.05% or less.

[0024] Although there are Si, Fe, Cr, etc. as an unescapable impurity by elements other than the above in an interlayer's aluminum alloy, if 0.7% or less and Cr of 0.6% or less and Fe are 0.20% or less, the range, i.e., Si, generally permitted, there is especially no problem in respect of workability, corrosion resistance, etc. However, about Si and Fe, it is more desirable to consider as less than [Si0.20%] and less than [Fe0.20%].

[0025] next, the configuration of the brazing sheet concerning this invention -- a core material -- on the other hand (one side) -- or -- both (both sides) -- although the interlayer material which consists of said aluminum alloy was prepared and the clad of the wax material was further carried out on it, that concrete configuration has the mode of drawing 1 (a), (b), (c), and (d), and this point was already explained. In addition, how to prepare the interlayer material in a brazing sheet has wax material on a core material, and prepares between the core material of a side with severe corrosive environment, and wax material.

For example, in the case of the DORON cup type evaporator as [shown in drawing 4], it is correspond a side on the outside of the brazing sheet which meets with the open air (b of drawing 1), and, in the case of a car heater with a DORON cup type inner fin (an inside is water and external surface is the open air), the corrosive environment of an inside-and-outside side is severe, and it prepares in both sides of the core material of a brazing sheet (a of drawing 1).

[0026] Moreover, the interlayer of the brazing sheet made from aluminum alloy concerning this invention sets the thickness to 30-150 micrometers. An interlayer's thickness was set to 30 micrometers or more because Cu of a core material passed an interlayer in the case of below this and was spread to wax material in it at the time of soldering heating. Melting and in case it solidifies, a wax is discharged by the eutectic section and condenses, and Cu which reached wax material reduces corrosion resistance. Moreover, it is because the board thickness which remains when the part which carries out the sacrifice corrosion prevention of the core material while material reinforcement will fall if, as for having set the middle class's thickness to 150 micrometers or less, the middle class becomes thick too much to the board thickness of a brazing sheet, and shaping becomes difficult increases too much and corrosion advances becomes thin and it becomes impossible to bear the internal pressure of a heat exchanger.

[0027] There is especially no limit about the aluminum-Si system alloy wax material used for this invention. 4045 (example aluminumof representation-10%Si alloy) used for the usual noncorrosive flux soldering, 4343 (example aluminumof representation-7%Si alloy), etc. can be used. Moreover, what added Sn, Zn, and In for grant of what added Bi etc. for the improvement in a fluidity of a wax, and the sacrifice effectiveness can be used for an aluminum-Si alloy. Moreover, although 5 - 20% per one side can be just used for the rate of a clad of the wax material which carries out a clad to a core material to ** and the usual rate of a clad, i.e., total board thickness, thickness of the wax material which carries out a clad on the interlayer in this invention is set to 30-150 micrometers. Thus, soldering with the amount of wax material there is having limited [little] and sufficient [a thing] when thickness is less than 30 micrometers is not performed. Moreover, when 150 micrometers is exceeded, it is the part in which the amount of wax material increases too much and waxes, such as the fillet section, accumulate, and is because the phenomenon which a core material corrodes occurs. In addition, when carrying out the clad of the wax material according to an application (b of drawing 1), the other sides of the core material in the case of preparing an interlayer only in one side of a core material may not carry out the clad of the wax material, and, in the case of nakedness (c of drawing 1), may carry out the clad of the sacrifice material (d of drawing 1).

[0028] Although the configuration of invention of the brazing sheet made from aluminum alloy concerning this invention is as above, it explains invention of claim 2 below. Invention of claim 2 is one embodiment of invention of claim 1, and is the brazing sheet made from aluminum alloy which contained Sn 0.05 to 0.5% in the aluminum-Si system alloy wax material of claim 1. Since it is discharged by the eutectic section in case wax material solidifies Sn after soldering heating, it can neutralize the potential of the eutectic section and can raise further the corrosion resistance on the front face of a brazing sheet after soldering heating. The effectiveness does not have an addition below at a lower limit, if an addition exceeds a upper limit, hot rolling nature will fall and manufacture will become difficult. Moreover, the corrosion resistance of the front face after soldering heating falls, and advance of corrosion is promoted. Therefore, although an addition is made into 0.05 - 0.5%, considering as 0.05 - 0.2% is more desirable. Other requirements are the same as that of said claim 1.

[0029]

[Example] Next, the example (example of this invention) of this invention is further explained to a detail with the example of a comparison.

[Example 1] The core material and interlayer material of the various alloy presentations shown in Table 1 were prepared. Combining these core materials and interlayer material, as shown in Table 1, interlayer material was doubled with one side of a core material, and the clad (the rate of a clad is 10% per one side to total board thickness) of the wax material which becomes both sides on it from JIS4045 alloy further was carried out. In addition, various an interlayer's clad thickness was changed. Thus, about the set ingredient for rolling, according to the conventional method, a soaking, hot rolling, intermediate

annealing, and cold rolling were performed, and the brazing sheet (100 micrometers in 20-200 micrometers in an interlayer's thickness, thickness of wax material) with a thickness of 1.0mm was manufactured. The configuration of the brazing sheet of these versatility is shown in Table 1. Thus, it is noncorrosive flux (mixed flux of KAlF4 and K2 AlF5) after washing the brazing sheet (No.1-18) shown in obtained Table 1 and carrying out finish annealing 10 g/m2 It applied, and by nitrogen-gas-atmosphere mind, it heated by having cursed for 873 Kx3 minutes, and considered as the test specimen in inside.

[0030] The JIS No. 5 test piece was produced using these test specimens, and tensile strength was measured. Moreover, press forming was performed using these test specimens. The overhang height of mold goods was measured and it evaluated whether sufficient shaping height would be obtained. Furthermore, one side (side which does not have an interlayer) of all test specimens was covered with resin, and the corrosion test (copper accelerated acetic acid salt spray test) was carried out about the front face by the side of an interlayer. The test specimen was taken out in the place which passed after [test initiation] 500 hours and, and 1000 hours, the surface corrosion product was removed, and the corrosion situation of an ingredient was evaluated. Evaluation measured the pitting depth of the maximum pitting section by the depth of focus method using the optical microscope. These measurement results were written together to Table 1.

[0031]

[Table 1]

区分	No	ブレージングシート（板厚:1.0mm） 芯材合金成分（mass%） Si	Fe	Cu	Mn	Mg	Ti	Al	中間層材（芯材の片面にクラッド） 合金成分（mass%） Si	Fe	Cu	Mg	Mn	Zn	Ti	Al	クラッド厚さ（μm）	ろう材合金No.	耐食性 最大孔食深さ（μm） 試験時間、500時間後の場合	試験時間、1000時間後の場合	加熱後の引張強さ（MPa）	参考 成形高さ（mm）
本発明例	1	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	150	4045	180	210	143	8.15
	2	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	4045	150	230	145	8.12
	3	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	50	4045	170	270	146	8.13
	4	0.1	0.2	0.5	1.0	0.2	—	残	0.1	0.2	—	—	0.6	1.0	—	残	100	4045	130	200	141	8.21
	5	0.1	0.2	0.5	0.6	0.5	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	4045	140	210	138	8.25
	6	0.1	0.2	0.3	1.0	0.1	—	残	0.1	0.2	—	—	1.0	2.0	—	残	100	4045	130	230	132	8.27
	7	0.1	0.2	0.3	1.0	0.1	0.15	残	0.1	0.2	—	—	0.6	2.0	0.15	残	100	4045	120	200	130	8.28
	8	0.1	0.2	0.3	0.6	0.5	—	残	0.1	0.2	—	—	1.0	2.0	—	残	100	4045	130	220	129	8.31
	9	0.1	0.2	0.3	0.6	0.2	0.15	残	0.1	0.2	—	—	1.0	2.0	—	残	100	4045	120	240	127	8.30
	10	0.1	0.2	0.15	1.0	0.5	—	残	0.1	0.2	—	—	1.0	2.0	—	残	100	4045	140	250	121	8.33
	11	0.1	0.2	0.15	1.0	0.2	0.15	残	0.1	0.2	—	—	1.0	2.5	0.08	残	100	4045	160	230	120	8.32
比較例	12	0.1	0.2	0.5	1.0	0.1	—	残	0.1	0.2	—	—	1.0	1.0	—	残	20	4045	310	450	147	8.14
	13	0.1	0.2	0.5	1.0	0.1	—	残	0.1	0.2	—	—	1.0	1.0	—	残	200	4045	270	520	140	8.24
	14	0.1	0.2	1.3	0.6	0.1	—	残	0.1	0.2	—	—	0.6	1.0	—	残	100	4045	380	貫通	146	8.15
	15	0.1	0.2	0.5	1.0	0.1	—	残	0.1	0.2	—	—	1.0	6.0	—	残	100	4045	550	貫通	144	8.20
従来例	16	0.1	0.15	0.5	1.0	0.3	—	残	0.1	0.15	—	—	—	—	—	残	100	4045	340	貫通	115	8.51
	17	0.1	0.15	0.5	1.0	0.3	—	残	0.2	0.3	0.15	—	—	—	—	残	100	4045	630	貫通	118	8.49
	18	0.2	0.4	0.3	1.3	0.2	—	残	0.1	0.15	—	—	—	—	—	残	100	4045	230	550	112	8.55

注：表1及び表2において、
1) 芯材において、Tiの－は0.01mass%未満を意味し、Si、Feは不純物である。
2) 中間層材において、Cu、Mgの－は0.05mass%以下を意味し、Si、Feは不純物である。

[0032] It turns out that the brazing sheet (example of this invention) by this invention is excellent in reinforcement compared with the conventional example, and it excels in corrosion resistance compared with the example of a comparison, and the material property is excellent on the whole so that clearly from Table 1. In addition, the moldability of the brazing sheet by this invention is maintaining level

conventionally so that clearly from Table 1.
 [0033] [Example 2] The core material and interlayer material of the various alloy presentations shown in Table 1 were prepared. Combining these core materials and interlayer material, as shown in Table 1, the clad (the rate of a clad is 10% per one side to total board thickness) of the wax material which one side of a core material was made to contain 0.1 to 0.6% further to both sides on it at JIS4045 alloy including interlayer material was carried out. Thus, about the set ingredient for rolling, according to the conventional method, a soaking, hot rolling, intermediate annealing, and cold rolling were performed, and the brazing sheet (100 micrometers in 100 micrometers in an interlayer's thickness, thickness of wax material) with a thickness of 1.0mm was manufactured. The configuration of the brazing sheet of these versatility is shown in Table 2. It is the flux same after giving washing and finish annealing for the brazing sheet (No.19-26) shown in these tables 2 as an example 1 10 g/m2 It applied, and by nitrogen-gas-atmosphere mind, it heated by having cursed for 873 Kx3 minutes, and considered as the test specimen in inside. One side (side which does not have an interlayer) of these test specimens was covered with resin, and the corrosion test (copper accelerated acetic acid salt spray test) was carried out about the front face by the side of an interlayer. The test specimen was taken out in the place which passed after [test initiation] 500 hours, and 1000 hours, the surface corrosion product was removed, and the corrosion situation of an ingredient was evaluated. Evaluation measured the pitting depth of the maximum pitting section by the depth of focus method using the optical microscope. This measurement result was written together to Table 2.
[0034]
[Table 2]

	No	ブレージングシート（板厚:1.0mm）																				耐食性 最大孔食深さ（μm）	
		芯材合金成分（mass%）								中間層材（芯材の片面にクラッド）										ろう材		試験時間500時間の場合	試験時間1000時間後の場合
										合金成分（mass%）								クラッド厚（μm）	合金成分(mass%)			
		Si	Fe	Cu	Mn	Mg	Ti	Al	Si	Fe	Cu	Mg	Mn	Zn	Ti	Al		Si	Sn	Al		
本発明例	19	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	10.0	0.1	残	110	170
	20	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	10.0	0.2	残	120	180
	21	0.1	0.2	0.3	1.0	0.1	0.15	残	0.1	0.2	—	—	0.6	2.0	0.15	残	100	10.0	0.1	残	100	190
	22	0.1	0.2	0.3	1.0	0.1	0.15	残	0.1	0.2	—	—	0.6	2.0	0.15	残	100	10.0	0.2	残	120	180
	23	0.1	0.2	0.15	1.0	0.2	0.15	残	0.1	0.2	—	—	1.0	2.5	0.08	残	100	10.0	0.1	残	120	190
比較例	24	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	10.0	0.6	残	390	730
	25	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	10.0	0.6	残	490	790
	26	0.1	0.2	0.3	1.0	0.1	0.15	残	0.1	0.2	—	—	0.6	2.0	0.15	残	100	10.0	0.8	残	550	750

[0035] It turns out that corrosion resistance of the brazing sheet (example of this invention) which contained Sn 0.1 to 0.2% in the wax material concerning this invention is improving more from what

does not contain Sn so that clearly from Table 2 (refer to [of an example 1 / Table 1]). Moreover, it turns out that corrosion resistance is inferior in what contained Sn 0.6% in wax material (example of a comparison) on the contrary.

[0036]

[Effect of the Invention] When this invention can raise corrosion resistance sharply by preparing an interlayer between the core material of a side with the severe use top corrosive environment of the brazing sheet made from aluminum alloy, and wax material as explained in full detail above, therefore the brazing sheet concerning this invention is used for a heat exchanger, it becomes possible to raise the anticorrosion life of the heat exchanger remarkably. Moreover, remarkable effectiveness is done so on industry satisfactory also in respect of reinforcement and a moldability.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates an automobile, the heat exchanger made from aluminum alloy of various industrial use, etc. to the corrosion resistance suitable outstanding brazing sheet made from aluminum alloy for this, when soldering and carrying out junction assembly especially by noncorrosive flux, soldering (blazing) and. In addition, in this specification, although all presentations of aluminum alloy are mass%, they are omitted and % only describes them.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] When manufacturing the complicated structures, such as a heat exchanger made from aluminum alloy, the soldering method is an effective junction means. This soldering method makes aluminum or aluminum alloy a core material, and it is fabricated in various configurations using the brazing sheet which carried out the clad to those one side or both sides, using aluminum alloy wax material as hide material. These members, predetermined structure, for example, heat exchanger, in assembly and noncorrosive flux (fluoro potassium aluminate complex salt) soldering KAlF4, K2 AlF5, and K3 AlF6 etc. -- after applying mixed flux, it is the approach of soldering by heating this in nitrogen reducing atmosphere.
[0003] Various kinds of aluminum alloys for core materials and aluminum alloy wax material for hide material are developed by the brazing sheet, and it is standardized by JIS-Z -3263 and JIS-H -4000 about these ingredients in current. As a brazing sheet for soldering used for a heat exchanger, JIS3003 (example aluminumof representation-0.15%Cu-1.1%Mn alloy) and JIS6951 (example aluminum-of representation0.4%Si-0.3%Cu-0.6%Mg alloy) are used as a core material, and, usually JIS4045 (example aluminumof representation-10%Si alloy) and JIS4343 (example aluminumof representation-7.5%Si alloy) wax material are used as hide material. Moreover, board thickness of a brazing sheet is about 0.3-1.5mm, to total board thickness, the rate of a clad of wax material is 5 - 15% per one side, and the clad is carried out to one side or both sides.
[0004] As a heat exchanger made from aluminum alloy which has the hollow structure using such a brazing sheet, the DORON cup type evaporator, the oil cooler, the radiator, etc. are manufactured. As shown in drawing 4 , for example, the DORON cup type evaporator 10 The brazing sheet which carried out the clad of the aforementioned aluminum alloy wax material is used for both sides of the aforementioned aluminum alloy core material. The refrigerant path shaping member 1 as shown in drawing 2 and drawing 3 is manufactured by press forming. It is what arranged the corrugated fin 2 between the members 1 which carried out the laminating and carried out the laminating of this member 1 as shown in drawing 4 , arranged and carried out assembly of side plates 7 and 7, the refrigerant inlet pipe 8, and the refrigerant outlet pipe 9 further, and soldered this. Soldering is performed by heating to about 873 K in nitrogen-gas-atmosphere mind.

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EFFECT OF THE INVENTION

[Effect of the Invention] When this invention can raise corrosion resistance sharply by preparing an interlayer between the core material of a side with the severe use top corrosive environment of the brazing sheet made from aluminum alloy, and wax material as explained in full detail above, therefore the brazing sheet concerning this invention is used for a heat exchanger, it becomes possible to raise the anticorrosion life of the heat exchanger remarkably. Moreover, remarkable effectiveness is done so on industry satisfactory also in respect of reinforcement and a moldability.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The thinning of ingredient board thickness is being required of the heat exchanger for automobiles with lightweight-izing of an automobile. On the other hand, since the operating environment of an automobile is various, the ingredient which can bear all service conditions is needed. Especially in the heat exchanger, it is anxious for the development of a brazing sheet whose corrosion resistance is the demand characteristics most important for an ingredient, and corrosion resistance has it, and various examination is performed.

[0006] Although the corrosion resistance of a brazing sheet is related to the element part blanket-like voice of the direction of board thickness of an ingredient, when the element contributed to the corrosion resistance of ingredients, such as Cu and Zn, performs soldering heating, it will be in the distribution condition of the front flesh-side symmetry centering on a board thickness core. Therefore, when pitting occurs on a brazing sheet front face, the pitting advance after the ingredient with the pitting advance slower than a board thickness core by the side of a front face passes a board thickness core becomes quick. That is, although the part which contributes to corrosion-resistant improvement is the one half of board thickness, there is a limitation in an improvement of the penetration life by the element addition to a core material instead of an overstatement.

[0007] Moreover, addition of Cu is added by the core material of a brazing sheet in order to make potential of aluminum **, and to raise corrosion resistance. However, Cu added in the core material is diffused in the wax material fused at the time of soldering heating, and in case wax material solidifies after soldering heating, the eutectic section discharges and condenses. Therefore, the corrosion of the layer to which wax material re-solidified the brazing sheet with much Cu to the core material advances quickly. Therefore, there is a limitation in the addition of elements, such as Cu for corrosion-resistant improvement, to the core material of a brazing sheet.

[0008] Moreover, in noncorrosive flux soldering, since the fluoride which the aforementioned flux and Mg in an ingredient react, will shine, and checks a sex is generated, Mg cannot be added into an ingredient. Therefore, the diffusion to the wax material of Mg in a core material is prevented, and preparing the interlayer who consists of a 1XXX system alloy ingredient of JIS 1050 and 1070 and 1100 grades between a core material and wax material for the purpose of improvement in soldering nature is proposed, and carrying out the purpose of the corrosion resistance improvement in a core material, and preparing the interlayer who added Zn etc. further to said interlayer material is also proposed (for example, JP,2-30394,A). However, it was not able to be said that this brazing sheet was still more enough in respect of corrosion resistance and the reinforcement of an ingredient. The technical problem of this invention is solving the aforementioned problem, is specifically the point of corrosion resistance and the reinforcement of an ingredient, and is finding out the further excellent brazing sheet made from aluminum alloy.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to solve the aforementioned problem and for this invention persons to raise the corrosion resistance of a brazing sheet member wholeheartedly as a result of examination In order to prevent the diffusion to the wax material of elements, such as Cu in the diffusion and the core material to the core material of wax material, during soldering heating The middle class is prepared between wax material and a core material, this middle class's alloy presentation and knowledge that clad thickness is greatly related to the corrosion resistance of a brazing sheet and material strength are acquired further, and this invention is completed.
[0010] Namely, invention of claim 1 for solving the aforementioned technical problem Mn: 0.5-2.0%, Cu:0.1-1.0%, Mg:0-1.0%, To one side or both sides of aluminum alloy core material to which Ti:0-0.3% is contained and the remainder consists of aluminum and an unescapable impurity Mn:0.01-2.0%, Zn:0.05-5.0%, and Ti:0-0.3% are contained. Furthermore, it is aluminum alloy with which it regulates less than [Mg:0.05%] and less than [Cu:0.05%], and the remainder consists of aluminum and an unescapable impurity. Thickness is the brazing sheet made from aluminum alloy which carries out the description of having prepared the interlayer who is 30-150 micrometers, and having doubled aluminum-Si system alloy wax material by 30-150-micrometer clad thickness on said interlayer, and it is [0011]. Invention of claim 2 is a brazing sheet made from aluminum alloy according to claim 1 characterized by making said aluminum-Si system alloy wax material contain Sn:0.05-0.5% further.
[0012]
[Embodiment of the Invention] Hereafter, this invention is further explained to a detail. Invention of claim 1 Mn:0.5-2.0%, Cu:0.1-1.0%, To one side or both sides of aluminum alloy core material to which Mg:0-1.0% and Ti:0-0.3% are contained, and the remainder consists of aluminum and an unescapable impurity Mn:0.01-2.0%, Zn:0.05-5.0%, and Ti:0-0.3% are contained. Furthermore, it is aluminum alloy with which it regulates less than [Mg:0.05%] and less than [Cu:0.05%], and the remainder remainder consists of aluminum and an unescapable impurity. Thickness prepares the interlayer who is 30-150 micrometers, and considers as the summary of invention of the brazing sheet made from aluminum alloy which doubled aluminum-Si system alloy wax material by 30-150-micrometer clad thickness on said interlayer. That is, it is the brazing sheet which prepared the interlayer with a thickness of 30-150 micrometers in one side or both sides of an aluminum-Mn-Cu-(Mg)-(Ti) alloy core material with the aluminum-Mn-Zn-(Ti) alloy, and carried out the thickness 30-150-micrometer clad of the aluminum-Si system alloy wax material further on this interlayer.
[0013] When the configuration of the cross section of this brazing sheet is explained by a diagram, as shown in drawing 1 (a), (b), (c), and (d), there are four modes according to the purpose of use. (a) of drawing 1 is interlayers 4 and 4 to both sides of a core material 5, It prepares and is the wax material 3 and 3 on both this interlayer, It is what was prepared and they are an oil cooler in the case of thinking the corrosion resistance of an inside-and-outside side as important, for example, the tube (those with an inner fin) of a car heater, etc. as an actual application. although (b) forms an interlayer 4 in one side of a core material 5 and forms the wax material 3 on this interlayer -- the relation of an application to the core material 5 -- on the other hand -- being also alike -- wax material 3, It is what was prepared and is a

DORON cup type evaporator as [as an actual application, shown in drawing 4 by the case where outside corrosion resistance is thought as important, for example] etc. (an inside is not so important for corrosion resistance in this case because of chlorofluocarbon).
[0014] although (c) forms an interlayer 4 in one side of a core material 5 and forms the wax material 3 on this interlayer -- the relation of an application to the core material 5 -- on the other hand -- being alike -- wax material 3, There is nothing and it continues being nakedness. As an actual application, it is the tube (welded tube tube) of a parallel flow type capacitor etc. in the case where outside corrosion resistance is thought as important, for example (an inside is not so important for corrosion resistance in this case because of chlorofluocarbon). (d) -- one side of a core material 5 -- an interlayer 4 -- preparing -- this interlayer top -- the wax material 3 -- preparing -- a core material 5 -- on the other hand -- being alike -- sacrifice material 6 like 7072 (aluminum-Zn alloy) is formed. As an actual application, it is the tube (welded tube tube) of a radiator etc., for example (in this case, an inside is water and external surface is the open air).
[0015] Although the concrete configuration of the brazing sheet concerning this invention is as above next, it explains aluminum alloy used for the core material of the sheet of this invention. The semantics of the alloying element of a core material alloy and the reason for limitation of the addition range are as follows. Although it adds 0.1 to 1.0% in order that Cu may raise corrosion resistance, under by the lower limit, it becomes that the effectiveness is weak and it is easy to generate the grain community corrosion exceeding a upper limit, and since the diffusing capacity to the core material of wax material also increases, corrosion resistance is reduced. Therefore, although the range is made into 0.1 - 1.0%, considering as 0.15 - 0.5% is more desirable.
[0016] Although it adds 0.5 to 2.0% for the improvement in on the strength, under by the lower limit, Mn has little effectiveness of the improvement in on the strength, and its diffusing capacity of the wax material to a core material increases during heating by exceeding a upper limit, and it reduces soldering nature and corrosion resistance. Therefore, although the range is made into 0.5 - 2.0%, considering as 0.8 - 1.5% is more desirable.
[0017] Mg is added 0 to 1.0% for the improvement in on the strength. 0% (less than 0.01%), 0 - 1.0% of semantics is the case where it does not add at all, and when adding, it is made into 0.01 - 1.0%. If an addition exceeds 1.0%, during soldering heating, the diffusing capacity of the wax material to a core material will increase, and soldering nature and corrosion resistance will be reduced. Therefore, the range is made into 0 - 1.0%. Specifically, it is desirable to add as follows by the aforementioned purpose of use. That is, when it is the four-layer material (b of drawing 1) from which an interlayer is prepared only for one of the two between wax material and a core material, and other sides serve as wax material, Mg is not added to a core material or 0.05% or less of addition is desirable in respect of the soldering nature (cursing a side the wax material 3 of b of drawing 1 , and sex) by noncorrosive flux. moreover, although an interlayer is prepared only for one of the two between wax material and a core material, when it is the three-layer material and four-layer material (c of drawing 1 , d) which are alike on the other hand and do not have wax material in the case of the five-layer material (a of drawing 1) which prepares an interlayer in both between wax material and a core material, addition of Mg to a core material is 0.1 - 0.6% preferably 0.05 to 1.0%.
[0018] Ti is added 0 to 0.3%, in order to raise corrosion resistance. 0% (less than 0.01%), 0 - 0.3% of semantics is the case where it does not add at all, and when adding, it is made into 0.01 - 0.3%. If an addition exceeds 0.3%, the crystallization object of big and rough Ti will be produced, and corrosion resistance will be injured conversely. Therefore, although the range of Ti is made into 0 - 0.3%, whether it adds or it does not carry out choose suitably by the application of a product, and it is determined. In addition, when adding, it is more desirable to consider as about 0.05 - 0.2%.
[0019] Although there are Si, Fe, Cr, Zn, etc. as an unescapable impurity by elements other than the above in a core material, Fe is especially satisfactory 0.7% or less 0.6% or less, if 0.20% or less and Zn of Cr are 0.40% or less, the range, i.e., Si, generally permitted. However, about Si and Fe, it is more desirable to consider as less than [Si0.20%] and less than [Fe0.20%].
[0020] Next, the aluminum-Mn-Zn-(Ti) alloy used for the interlayer material of the brazing sheet made

from aluminum alloy by this invention is explained. Although Mn of an alloying element contributes to improvement in the reinforcement of an ingredient and Zn and Ti contribute to the corrosion resistance improvement in an ingredient, it is as follows for details. Although it adds 0.01 to 2.0% for the improvement in on the strength, at less than 0.01%, Mn has little effectiveness of the improvement in on the strength, and its diffusing capacity of the wax material to interlayer material increases during heating by exceeding 2.0%, and it reduces corrosion resistance. Therefore, although the range is made into 0.01 - 2.0%, considering as 0.3 - 1.3% is more desirable.

[0021] In order to raise corrosion resistance, it adds 0.05 to 5.0%, but under by the lower limit, the middle class's self-corrosion resistance will fall and Zn will check the corrosion resistance as a brazing sheet, if there is little effectiveness of corrosion-resistant improvement and it exceeds a upper limit. Therefore, although the range is made into 0.05 - 5.0%, considering as 0.5 - 3.0% is more desirable.

[0022] Ti is added 0 to 0.3%, in order to raise corrosion resistance. 0% (less than 0.01%), 0 - 0.3% of semantics is the case where it does not add at all, and when adding, it is made into 0.01 - 0.3%. If an addition exceeds 0.3%, the crystallization object of big and rough Ti will be produced, and corrosion resistance will be injured conversely. Therefore, although the range of Ti is made into 0 - 0.3%, whether it adds or it does not carry out choose suitably by the application of a product, and it is determined. In addition, when adding, it is more desirable to consider as about 0.05 - 0.2%.

[0023] In order that Mg may form flux and a fluoride, may shine in the case of noncorrosive flux soldering and may check a sex, it is regulated to 0.05% or less. In order that Cu may be diffused in wax material and may check corrosion resistance in the case of soldering, it is regulated to 0.05% or less.

[0024] Although there are Si, Fe, Cr, etc. as an unescapable impurity by elements other than the above in an interlayer's aluminum alloy, if 0.7% or less and Cr of 0.6% or less and Fe are 0.20% or less, the range, i.e., Si, generally permitted, there is especially no problem in respect of workability, corrosion resistance, etc. However, about Si and Fe, it is more desirable to consider as less than [Si0.20%] and less than [Fe0.20%].

[0025] next, the configuration of the brazing sheet concerning this invention -- a core material -- on the other hand (one side) -- or -- both (both sides) -- although the interlayer material which consists of said aluminum alloy was prepared and the clad of the wax material was further carried out on it, that concrete configuration has the mode of drawing 1 (a), (b), (c), and (d), and this point was already explained. In addition, how to prepare the interlayer material in a brazing sheet has wax material on a core material, and prepares between the core material of a side with severe corrosive environment, and wax material. For example, in the case of the DORON cup type evaporator as [shown in drawing 4], it is correspond a side on the outside of the brazing sheet which meets with the open air (b of drawing 1), and, in the case of a car heater with a DORON cup type inner fin (an inside is water and external surface is the open air), the corrosive environment of an inside-and-outside side is severe, and it prepares in both sides of the core material of a brazing sheet (a of drawing 1).

[0026] Moreover, the interlayer of the brazing sheet made from aluminum alloy concerning this invention sets the thickness to 30-150 micrometers. An interlayer's thickness was set to 30 micrometers or more because Cu of a core material passed an interlayer in the case of below this and was spread to wax material in it at the time of soldering heating. Melting and in case it solidifies, a wax is discharged by the eutectic section and condenses, and Cu which reached wax material reduces corrosion resistance. Moreover, it is because the board thickness which remains when the part which carries out the sacrifice corrosion prevention of the core material while material reinforcement will fall if, as for having set the middle class's thickness to 150 micrometers or less, the middle class becomes thick too much to the board thickness of a brazing sheet, and shaping becomes difficult increases too much and corrosion advances becomes thin and it becomes impossible to bear the internal pressure of a heat exchanger.

[0027] There is especially no limit about the aluminum-Si system alloy wax material used for this invention. 4045 (example aluminumof representation-10%Si alloy) used for the usual noncorrosive flux soldering, 4343 (example aluminumof representation-7%Si alloy), etc. can be used. Moreover, what added Sn, Zn, and In for grant of what added Bi etc. for the improvement in a fluidity of a wax, and the sacrifice effectiveness can be used for an aluminum-Si alloy. Moreover, although 5 - 20% per one side

can be just used for the rate of a clad of the wax material which carries out a clad to a core material to ** and the usual rate of a clad, i.e., total board thickness, thickness of the wax material which carries out a clad on the interlayer in this invention is set to 30-150 micrometers. Thus, soldering with the amount of wax material there is having limited [little] and sufficient [a thing] when thickness is less than 30 micrometers is not performed. Moreover, when 150 micrometers is exceeded, it is the part in which the amount of wax material increases too much and waxes, such as the fillet section, accumulate, and is because the phenomenon which a core material corrodes occurs. In addition, when carrying out the clad of the wax material according to an application (b of drawing 1), the other sides of the core material in the case of preparing an interlayer only in one side of a core material may not carry out the clad of the wax material, and, in the case of nakedness (c of drawing 1), may carry out the clad of the sacrifice material (d of drawing 1).

[0028] Although the configuration of invention of the brazing sheet made from aluminum alloy concerning this invention is as above, it explains invention of claim 2 below. Invention of claim 2 is one embodiment of invention of claim 1, and is the brazing sheet made from aluminum alloy which contained Sn 0.05 to 0.5% in the aluminum-Si system alloy wax material of claim 1. Since it is discharged by the eutectic section in case wax material solidifies Sn after soldering heating, it can neutralize the potential of the eutectic section and can raise further the corrosion resistance on the front face of a brazing sheet after soldering heating. The effectiveness does not have an addition below at a lower limit, if an addition exceeds a upper limit, hot rolling nature will fall and manufacture will become difficult. Moreover, the corrosion resistance of the front face after soldering heating falls, and advance of corrosion is promoted. Therefore, although an addition is made into 0.05 - 0.5%, considering as 0.05 - 0.2% is more desirable. Other requirements are the same as that of said claim 1.

[Translation done.]

EXAMPLE

[Example] Next, the example (example of this invention) of this invention is further explained to a detail with the example of a comparison.
[Example 1] The core material and interlayer material of the various alloy presentations shown in Table 1 were prepared. Combining these core materials and interlayer material, as shown in Table 1, interlayer material was doubled with one side of a core material, and the clad (the rate of a clad is 10% per one side to total board thickness) of the wax material which becomes both sides on it from JIS4045 alloy further was carried out. In addition, various an interlayer's clad thickness was changed. Thus, about the set ingredient for rolling, according to the conventional method, a soaking, hot rolling, intermediate annealing, and cold rolling were performed, and the brazing sheet (100 micrometers in 20-200 micrometers in an interlayer's thickness, thickness of wax material) with a thickness of 1.0mm was manufactured. The configuration of the brazing sheet of these versatility is shown in Table 1. Thus, it is noncorrosive flux (mixed flux of KAlF4 and K2 AlF5) after washing the brazing sheet (No.1-18) shown in obtained Table 1 and carrying out finish annealing 10 g/m2 It applied, and by nitrogen-gas-atmosphere mind, it heated by having cursed for 873 Kx3 minutes, and considered as the test specimen in inside.
[0030] The JIS No. 5 test piece was produced using these test specimens, and tensile strength was measured. Moreover, press forming was performed using these test specimens. The overhang height of mold goods was measured and it evaluated whether sufficient shaping height would be obtained. Furthermore, one side (side which does not have an interlayer) of all test specimens was covered with resin, and the corrosion test (copper accelerated acetic acid salt spray test) was carried out about the front face by the side of an interlayer. The test specimen was taken out in the place which passed after [test initiation] 500 hours and, and 1000 hours, the surface corrosion product was removed, and the corrosion situation of an ingredient was evaluated. Evaluation measured the pitting depth of the maximum pitting section by the depth of focus method using the optical microscope. These measurement results were written together to Table 1.
[0031]
[Table 1]

区分	No	ブレージングシート（板厚：1.0mm） 芯材合金成分（mass%） Si	Fe	Cu	Mn	Mg	Ti	Al	中間層材（芯材の片面にクラッド） 合金成分（mass%） Si	Fe	Cu	Mg	Mn	Zn	Ti	Al	クラッド厚さ（μm）	ろう材合金 No.	耐食性 最大孔食深さ（μm） 試験時間、500時間後の場合	試験時間、1000時間後の場合	加熱後の引張強さ（MPa）	参考 成形高さ（mm）
本発明例	1	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	150	4045	180	210	143	8.15
	2	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	4045	150	230	145	8.12
	3	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	50	4045	170	270	146	8.13
	4	0.1	0.2	0.5	1.0	0.2	—	残	0.1	0.2	—	—	0.6	1.0	—	残	100	4045	130	200	141	8.21
	5	0.1	0.2	0.5	0.6	0.5	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	4045	140	210	138	8.25
	6	0.1	0.2	0.3	1.0	0.1	—	残	0.1	0.2	—	—	1.0	2.0	—	残	100	4045	130	230	132	8.27
	7	0.1	0.2	0.3	1.0	0.1	0.15	残	0.1	0.2	—	—	0.6	2.0	0.15	残	100	4045	120	200	130	8.28
	8	0.1	0.2	0.3	0.6	0.5	—	残	0.1	0.2	—	—	1.0	2.0	—	残	100	4045	130	220	129	8.31
	9	0.1	0.2	0.3	0.6	0.2	0.15	残	0.1	0.2	—	—	1.0	2.0	—	残	100	4045	120	240	127	8.30
	10	0.1	0.2	0.15	1.0	0.5	—	残	0.1	0.2	—	—	1.0	2.0	—	残	100	4045	140	250	121	8.33
	11	0.1	0.2	0.15	1.0	0.2	0.15	残	0.1	0.2	—	—	1.0	2.5	0.08	残	100	4045	160	230	120	8.32
比較例	12	0.1	0.2	0.5	1.0	0.1	—	残	0.1	0.2	—	—	1.0	1.0	—	残	20	4045	310	450	147	8.14
	13	0.1	0.2	0.5	1.0	0.1	—	残	0.1	0.2	—	—	1.0	1.0	—	残	200	4045	270	520	140	8.24
	14	0.1	0.2	1.3	0.6	0.1	—	残	0.1	0.2	—	—	0.6	1.0	—	残	100	4045	380	貫通	146	8.15
	15	0.1	0.2	0.5	1.0	0.1	—	残	0.1	0.2	—	—	1.0	6.0	—	残	100	4045	550	貫通	144	8.20
従来例	16	0.1	0.15	0.5	1.0	0.3	—	残	0.1	0.15	—	—	—	—	—	残	100	4045	340	貫通	115	8.51
	17	0.1	0.15	0.5	1.0	0.3	—	残	0.2	0.3	0.15	—	—	—	—	残	100	4045	630	貫通	118	8.49
	18	0.2	0.4	0.3	1.3	0.2	—	残	0.1	0.15	—	—	—	—	—	残	100	4045	230	550	112	8.55

注：表1及び表2において、
1）芯材において、「－」は0.01mass%未満を意味し、Si、Feは不純物である。
2）中間層材において、Cu、Mgの－は0.05mass%以下を意味し、Si、Feは不純物である。

[0032] It turns out that the brazing sheet (example of this invention) by this invention is excellent in reinforcement compared with the conventional example, and it excels in corrosion resistance compared with the example of a comparison, and the material property is excellent on the whole so that clearly from Table 1. In addition, the moldability of the brazing sheet by this invention is maintaining level

conventionally so that clearly from Table 1.
[0033] [Example 2] The core material and interlayer material of the various alloy presentations shown in Table 1 were prepared. Combining these core materials and interlayer material, as shown in Table 1, the clad (the rate of a clad is 10% per one side to total board thickness) of the wax material which one side of a core material was made to contain 0.1 to 0.6% further to both sides on it at JIS4045 alloy including interlayer material was carried out. Thus, about the set ingredient for rolling, according to the conventional method, a soaking, hot rolling, intermediate annealing, and cold rolling were performed, and the brazing sheet (100 micrometers in 100 micrometers in an interlayer's thickness, thickness of wax material) with a thickness of 1.0mm was manufactured. The configuration of the brazing sheet of these versatility is shown in Table 2. It is the flux same after giving washing and finish annealing for the brazing sheet (No.19-26) shown in these tables 2 as an example 1 10 g/m2 It applied, and by nitrogen-gas-atmosphere mind, it heated by having cursed for 873 Kx3 minutes, and considered as the test specimen in inside. One side (side which does not have an interlayer) of these test specimens was covered with resin, and the corrosion test (copper accelerated acetic acid salt spray test) was carried out about the front face by the side of an interlayer. The test specimen was taken out in the place which passed after [test initiation] 500 hours, and 1000 hours, the surface corrosion product was removed, and the corrosion situation of an ingredient was evaluated. Evaluation measured the pitting depth of the maximum pitting section by the depth of focus method using the optical microscope. This measurement result was written together to Table 2.
[0034]
[Table 2]

	No	ブレージングシート（板厚:1.0mm） 芯材合金成分（mass%） Si	Fe	Cu	Mn	Mg	Ti	Al	中間層材（芯材の片面にクラッド） 合金成分（mass%） Si	Fe	Cu	Mg	Mn	Zn	Ti	Al	クラッド厚（μm）	ろう材 合金成分(mass%) Si	Sn	Al	耐食性 最大孔食深さ（μm） 試験期間500時間後の場合	試験期間1000時間後の場合
本発明例	19	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	10.0	0.1	残	110	170
	20	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	10.0	0.2	残	120	180
	21	0.1	0.2	0.3	1.0	0.1	0.15	残	0.1	0.2	—	—	0.6	2.0	0.15	残	100	10.0	0.1	残	100	190
	22	0.1	0.2	0.3	1.0	0.1	0.15	残	0.1	0.2	—	—	0.6	2.0	0.15	残	100	10.0	0.2	残	120	180
	23	0.1	0.2	0.15	1.0	0.2	0.15	残	0.1	0.2	—	—	1.0	2.5	0.08	残	100	10.0	0.1	残	120	190
比較例	24	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	10.0	0.6	残	390	730
	25	0.1	0.2	0.5	1.0	0.0	—	残	0.1	0.2	—	—	1.0	1.0	—	残	100	10.0	0.6	残	490	790
	26	0.1	0.2	0.3	1.0	0.1	0.15	残	0.1	0.2	—	—	0.8	2.0	0.15	残	100	10.0	0.8	残	550	750

[0035] It turns out that corrosion resistance of the brazing sheet (example of this invention) which contained Sn 0.1 to 0.2% in the wax material concerning this invention is improving more from what

does not contain Sn so that clearly from Table 2 (refer to [of an example 1 / Table 1]). Moreover, it turns out that corrosion resistance is inferior in what contained Sn 0.6% in wax material (example of a comparison) on the contrary.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing showing the cross-section structure of the brazing sheet made from aluminum alloy concerning this invention, and (a), (b), (c), and (d) are the mode.
[Drawing 2] It is the top view showing the refrigerant path shaping member for DORON cup evaporators.
[Drawing 3] It is a sectional view in the B-B' line of drawing 2 .
[Drawing 4] It is the explanatory view showing an example of a heat exchanger (DORON cup evaporator), and is the outline sectional view.
[Description of Notations]
1 Refrigerant Path Shaping Member for DORON Cup Evaporators
2 Fin
3 Three Wax material
4 Four Interlayer material
5 Core Material
6 Sacrifice Material
7 Seven Side plate
8 Refrigerant Inlet Pipe
9 Refrigerant Outlet Pipe
10 Heat Exchanger (DORON Cup Evaporator)

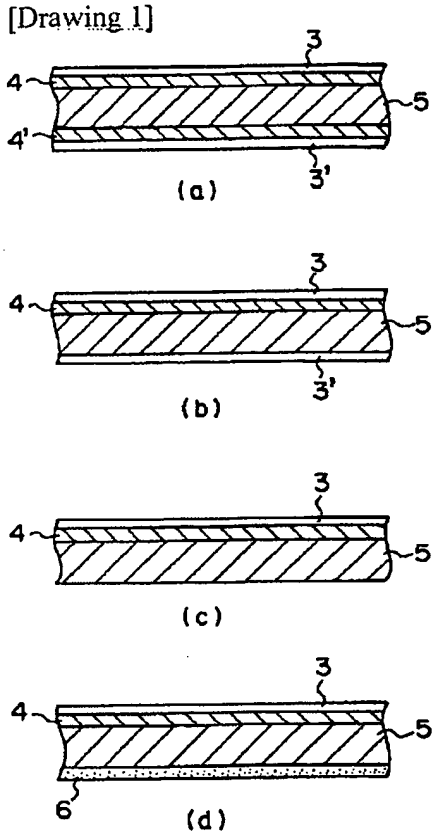
[Translation done.]

* NOTICES *

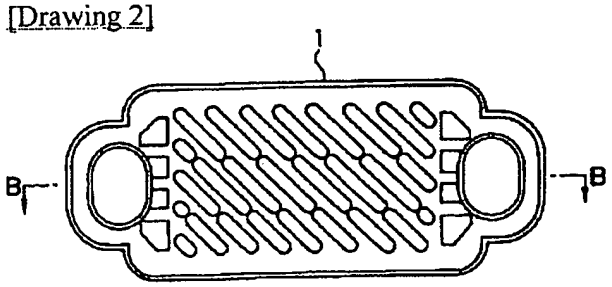
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

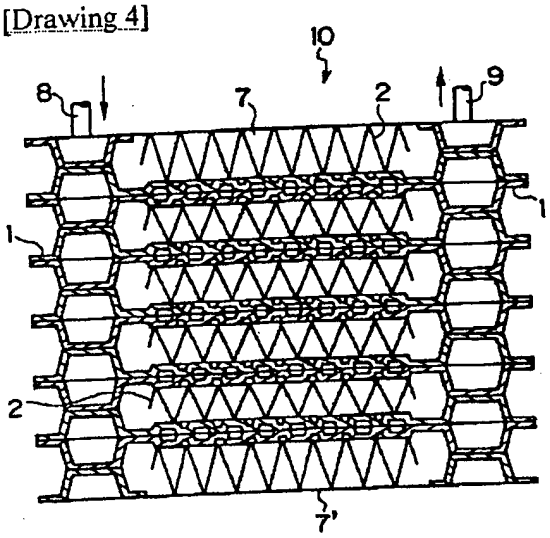


[Drawing 2]



[Drawing 3]

[Drawing 4]



[Translation done.]